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Brief Online Interventions to Improve 5k Running

Daniel T. Robinson
University of Wolverhampton,
UNITED KINGDOM

Stuart W Holliday
Focused Mind Coaching
UNITED KINGDOM

Ross Cloak
University of Wolverhampton,
UNITED KINGDOM

Andrew M. Lane*
University of Wolverhampton,
UNITED KINGDOM

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Abstract

Athletes and coaches strive to identify and learn to use interventions to enhance performance. The goal to be a competent user of psychological skills which aid performance is common among coaches and athletes. The frequency with which such skills are used and how they are learned is less well understood. Many athletes experience plateaus in performance despite efforts to improve, and as such are prime candidates to test interventions to enhance performance. The present study investigates the effectiveness of learning brief psychological skills among athletes who competed in a weekly 5km time trial whose performances had plateaued. Participants (n = 7) volunteered to follow brief psychological skills training which involved watching brief videos on how to use one of self-talk, reappraisal, if-then plans, or a non-treatment condition, but in the context of the study represent receiving encouragement to mentally prepare. Data analysis compared intervention results with baseline data taken from 2 months of data before the intervention. Results show that Psychological skills usage associated with finishing 347.37m (p = .019) ahead of baseline. Post-race reflections indicated using psychological skills helped re-appraise fatigue. Findings offer encouraging data on encouraging runners to engage in mental preparation and that following brief psychological skills training is helpful, however, confirmatory research is needed with larger samples.

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INTRODUCTION

Sport performance is important to athletes and coaches alike. Striving to improve performance is arguably the most common goal for athletes, coaches, and sport science practitioners . A recent meta-analysis indicated that using psychology interventions associated with enhanced performance, albeit with moderate effects (Lochbaum et al., 2022). Lochbaum et al. argued practitioners should avoid over promising the benefits of sport psychology services to clients. Of note, Lochbaum drew upon arguments from Terry, nearly three decades previously who offered guidelines to help researchers and practitioners alike to identify the relatively subtle effects of psychological interventions on performance (Terry, 1995). A recent expert review of evidence-based strategies that might help endurance athletes perform and resist the urge to slow down (Meijen et al., 2023). Meijen delimited their review to focus on psychological strategies which can be delivered as brief educational interventions (Meijen et al., 2023). Extending this line of investigation, the aim of the present study is to investigate the effects of brief interventions developed by Meijen on performance (Meijen, 2019). We embraced the five recommendations given by Lochbaum (Lochbaum et al., 2022)

The first is that having multiple indicators of performance offers a more reliable approach than a single one-off measure. There are of course instances where a one-off performance is a suitable approach, that is, when the athlete is striving to achieve an important goal. An important goal could mean striving to achieve World Championship qualification for an elite runner or striving to achieve a personal best for a competitive or participation runner. If the intervention is to make a meaningful

difference, this should be both greater and more consistent than previous performance assessed at baseline.

Second, researchers should specify the mechanism through which the intervention will lead to improved performance. Proposing the mechanism explains why an intervention would work, and as such should be assessed by researchers. For example, if using self-talk associates with improved performance, then it is important to know why it worked. If self-talk improved performance via stronger confidence to cope with intense physiological responses that occur when performing endurance sport at high intensity, then researchers should obtain a measure of confidence. The point is that it would be helpful if researchers specified the factors that should cause the proposed changes and sought to capture those in the methods. One approach to doing this is to use a mixed method design where quantitative methods assess the size of the effect and qualitative methods explore why the intervention worked.

Third, psychological skill training is appropriate among well-trained athletes whose performance has plateaued. Among well-trained athletes, increasing the volume of training can lead to overtraining rather than improved performance. A plateau in performance where participants are undergoing intense training suggests that meaningful improvements become more difficult to achieve.

Fourth, research has not focused on the cognitive load of learning psychological skills such as self-talk, imagery and goal-setting, all of which require cognitive processing. Additionally, some people will learn faster than others (Cumming & Eaves, 2018). Athletes can be self-taught users of existing techniques, for example, mood regulation strategies such as abdominal breathing or listening to music. Where these athletes are recruited as study participants, they may respond differently to novice users. Devonport, Lane, and Fullerton found imagery was not effective in improving performance, which the authors ascribed to effects of the cognitive load of learning to use imagery (Devonport et al., 2016).

Fifth, a major challenge when testing the effects of a psychological intervention is to establish a suitable control group or condition so that it is possible to show any effects of the intervention. A traditional non-treatment group offers one option, but such an approach does not consider the influence of belief effects (i.e., placebo/nocebo), which can either add or detract from the effectiveness of performance interventions (Beedie et al., 2018). If an individual believes that an intervention will be effective, this provides a motivating effect for engagement and so performance may improve via increased effort rather than the effect of the intervention per se. Therefore, an important factor that could influence the effectiveness is the role of self-regulation. Where participants seek improvement, and so are active agents in the process of change, then participating in a study which encourages mental preparation will have an intervention effect (Lane, Devonport et al., 2016; Lane, Totterdell et al., 2016). It is for this reason that control groups are difficult in applied research as it is not possible to have double-blind interventions (Terry et al., 2020). In online video interventions, practitioner effects are controlled to the extent that the same video is available for each person. In their study, Lane et al. used encouragement to mentally prepare as the control condition, not informing participants they were in the control group until after the study (Lane, Totterdell et al., 2016). They found the control group performed better than some intervention groups, ascribing that to the motivational effects of self-regulation.

Running is a sport where there is a huge appetite for consumption of sport psychology advice where many athletes use self-help interventions (Meijen et al., 2023; Meijen, 2019; Stanley et al., 2012). From a study of 506 runners, Stanley et al. found runners used re-appraisal, imagery and self-talk to regulate emotions (Stanley et al., 2012). Further, a study of 147 runners found active training to improve psychological skills associated with goal achievement (Lane, Devonport et al., 2016). And found that the intervention group improved against baseline in a pre-post design. However, the control group who were encouraged to mentally prepare, but were not given specific instructions on how to do so also improved significantly (Lane, Devonport et al., 2016).

The use of brief psychological skills training and encouraging people to mentally prepare was found to lead to rapid improvements in performance from a large-scale study of over 44,000 participants on a computer performance test. The study demonstrated that performance improved after following brief videos of psychological skills such as imagery, self-talk, and if-then planning significantly more than following an active control. The active control group were given

encouragement to prepare mentally, and results showed that they also improved significantly from baseline performance (Lane, Totterdell et al., 2016). The present case study builds upon this work by utilizing brief online videos to teach participants to use psychological skills and apply these to performance in the sport of running. We also compare the effects a brief instruction against active-control

METHOD

The study used a mixed-method with quantitative and qualitative data being collected. It also used a within-participant and between-groups (intervention v active-control), repeated-measures design (pre-study v within v post study performance). Volunteer participants were 7 experienced runners (Male: n = 4, Female, n = 3) aged between 29 and 45 years old. They were drawn from a population of active competitive runners who are identified via regularly competing in parkrun 5k events. Parkrun is a free weekly 5km event on which performance. Participants self-reported that they trained at least five times a week for the previous two years. It is acknowledged that self-report data could lack accuracy due to memory issues, but to estimate training a minimum of five times per week indicates a degree of seriousness and commitment to training. Male participants had run faster than 17-minutes for 5k and females faster than 20. On coming to the study and reflecting on 5km performances from the previous 4 months, participants reported that they believed that they had reached a performance plateau, defined as a variation in a maximal effort within 20 secs on the same course in comparable conditions.

This case study explores the use and effectiveness of brief online techniques from a project supported by The British Psychological Society called 'Research-Evaluated Strategies Intending to Support Training'. The RESIST project produced self-help videos designed to help runners manage the urge to slow down or stop during endurance performance. These interventions were proposed in a recent expert review paper on interventions suitable for this purpose (Meijen et al., 2023).

1. If-then planning (44 seconds) (Gollwitzer, 1999; Gollwitzer & Sheeran, 2006) involves asking people to identify the barriers and solutions to goal achievement. If-then planning is proposed to be an effective brief intervention as it places the problem (if) beside the intended solution (then) and so if the problem presents itself, the individual remembers to use the intended solution. Research has found this is an effective strategy in sport and in health contexts (Achtziger et al., 2008). The simplicity of learning an if-then plan is deemed particularly attractive for self-help interventions where compliance is an issue as repeating the if-then plan twice out loud has prompted effective usage (Achtziger et al., 2008). 'If I feel tired, and the desire to slow, then I will say to myself, pump arms, run tall, one step after another!'. 'If-then' plans have been shown to be an effective strategy that are not only brief but easy to learn (Achtziger et al., 2008; Lane, Devonport et al., 2016; Wolff et al., 2019). The skill was introduced as a way to plan to deal with unwanted thoughts you might have about slowing down or stopping. The key phrase 'identify a critical and put together a plan with participants being directed to the RESIST website for further examples.

2. Self-talk (41 seconds) is a skill designed to help provide a helpful narrative. Self-talk might influence performance through motivational processes, that is people try harder, or alternatively through enhanced skill performance, that is endurance athletes make better decisions and perform more economically (Latinjak et al., 2019; McCormick et al., 2020). Found motivational self-talk (i.e., keep going) can help endurance events whereas instructional self-talk (i.e., "steady pace") can help runners over shorter distances to guide their focus onto pace and form (Meijen, 2019; Van Raalte et al., 2015). Cooper found using a self-talk intervention improved athlete 800-metre run times by 9% over a baseline average. In the video, self-talk was described giving examples of instructional and motivational self-talk. Participants were advised to use self-talk in training and racing, using both instructional and motivational self-talk, and for self-talk to be purposeful and brief (Cooper et al., 2021).

3. Reappraisal (44 seconds) is a technique to reframe unwanted thoughts and feelings. Found re-appraisal designed to "not ignore the sensations of fatigue, but try to view them in a dispassionate way, as if a scientist studying running," had a lower level of perceived exertion than mental distraction or baseline first trial conditions (Giles et al., 2018).

Reappraisal was introduced by indicating that running hard will bring intense physiological responses, and therefore, assume that solutions will be needed. It went on to say that an inner voice

will tell you to slow down. It encouraged participants that learning to work with that inner voice is a good strategy. The presenter concluded that the more familiar you are with that inner voice, then the easier it is to regulate. Performance from the parkrun official results were used and cross-checked against each athlete's data on the online platform STRAVA. Finish time data was converted to average speed and presented as meters per second. Performance was self-referenced by comparing finish time with the average time to complete parkrun taken 2 months before the study. This established that participants' performance had hit a plateau by comparing against the parkrun database for performance.

Participants provided qualitative responses on preparation, for example 'How did you feel mentally before the 5km run?' and 'How did you feel physically before the 5km run?' Questions on the run itself, for example 'Did you feel that you ran at your maximum effort on the day? (regardless of finish time)', and 'How did you feel about your performance after the 5km run?'. Participants reported their usage and perceived effectiveness of the intervention, for example, 'Did you think about the if-then planning you had trialed in training in your warm-up?' and 'Did you use the 'if-then' skill in the parkrun'.

Ethical approval was received from the Institute of the first author. Written informed consent was obtained from all participants prior to participation. Participants were informed that they could withdraw from the study at any point in time should they wish to do so without reprisal. Participants were asked to run each parkrun as quickly as possible, and then provide reflections on the psychological strategies used via a questionnaire. Participants completed 5km runs over 12 weeks. Participants were then randomly allocated to either an intervention group or an active-control group. All participants were told the expectation of their commitment was for a minimum of 12 weeks with three measurements of repeat trials. Spacing was chosen for training effects. (1) Recruitment onto study: harvesting parkrun performance data for each athlete; (2) Week 1-3: Baseline measurement – 5km run; (3) Week 3-4 test: if-then plan – 5km run; (4) Week 7-8 test: self-talk – 5km run; (5) Week 11-12 test: re-appraisal –5km run; (6) Parkrun data for each athlete to assess post-study effects.

In terms of quantitative data analysis,this is an exploratory study and there are no published studies on which to estimate an effect size needed to conduct a power analysis, effect sizes and practical differences were used to judge significance. Recent discussion has questioned reliance on being guided solely by magnitude-based statistics (Nevill et al., 2018), although recognizing its value. In the present study, meaningful differences to the athletes were a key consideration. Arguably, a personal best, even a second improvement, represents an improvement. It is worth remembering that all participants indicated being on a performance plateau and had been for several months. In the present study, we used differences in meters covered per run and calculated how much faster they ran in comparison to their pre-study data.

To investigate the size of differences, data were stacked downwards showing 91 runs. This approach was done as it allows calculating both the mean and standard deviation at the key time points. As Hurst point out, the standard deviation in performance should narrow following an intervention (Hurst et al., 2020). If data are averaged, the variation in scores that produces the mean can be lost. In the present study, therefore, inspection of changes in standard deviation are important. We conducted statistical analysis using SPSS version 20 using ANOVA was to test the effects of intervention/control in comparison to baseline, control, and post-run. We acknowledge the limitations of using this technique in this context, but it is useful in determining the significance of changes and is helpful in how results feed forwards.

For qualitative analysis, Qualitative responses were analyzed using a conventional content analysis with the first two authors reading responses and classifying them into themes in relation to whether the intervention was effective and why. A general inductive approach to data analysis was adopted in line with recommendations by Creswell (Creswell, 2020). This method of data analysis was chosen in order that clear links between the research objective and two sets of interview data could be established in relation to the underlying experiences evident in the data. Transcriptions of both interviews were read in detail by the first author to identify themes and gain a holistic perspective of the participant's account. Subsequently, a second reviewer was consulted to review the interpretation and the themes extracted. Whilst accepting that qualitative researchers bring their own preconceptions and interpretations to the problem being studied (Denzin & Lincoln, 2005)"emphatic neutrality" stance (Patton, 2002) wherein the researcher cares about and is

interested in the people in the study, but neutral about the findings was followed. A second interview, along with a separate review by a second researcher was intended to increase dependability (Lincoln & Guba, 1985).

RESULTS AND DISCUSSION

Results

A comparison of treatments showed each intervention associated with a similar finish time and not statistically significant; if-then (M = 4.34 m/s), Reappraisal (M = 4.33m/s) and self-talk (M = 4.23 m/s). Descriptive statistics for performance by condition are contained in Table 1 and expressed in a self-referenced format in Figure 1. The average finish time for the control condition was M= 18:51 min/sec with the average finish time for the intervention group being M =18.14 min/sec and 17.32 min/sec for the control group. Converting finish time into distance suggests that that the control group finished 347.37m ahead of their own pre-study data, whereas the intervention group finished 164.11m ahead of their own pre-study data. In practical terms these are sizeable improvements. ANOVA results show a significant effect for difference in running speed by condition (F 4,83 = 2.78, p = .03, Partial Eta2 = .12). Post-hoc analysis indicated that following a control condition (see Figure 1 & Figure 2) was associated with significantly faster speed than control data (p = 0.019) and running speed post-study (p = .009). Results for post-study performance show the intervention slowed significantly (p = .019).

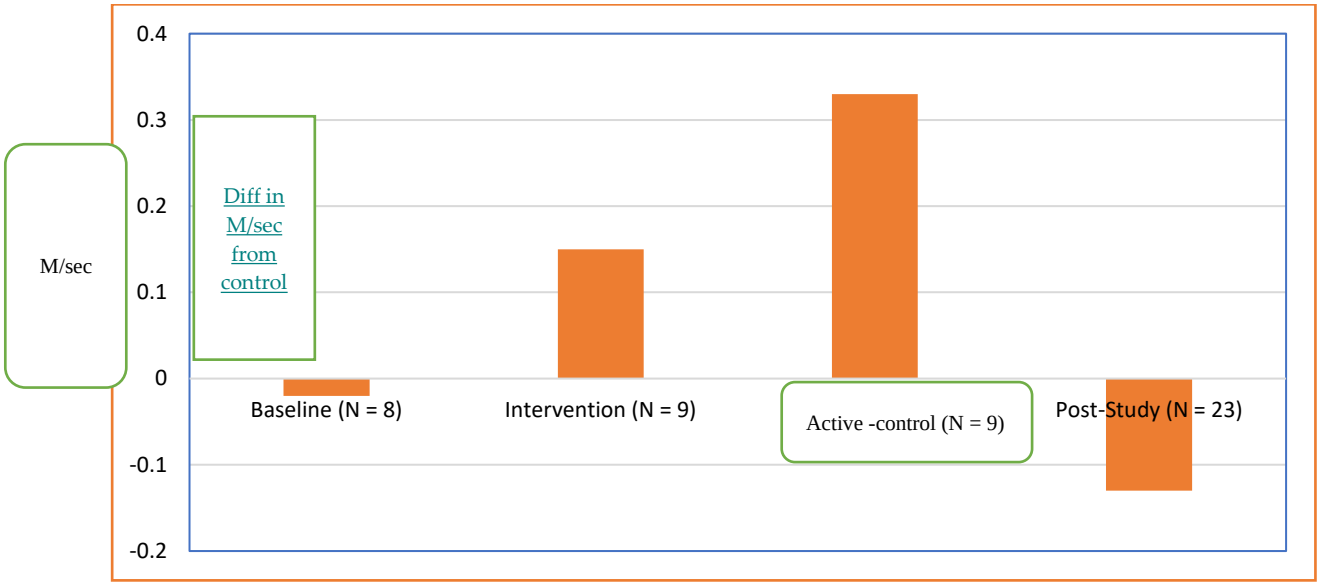

Figure 1. Running Speed time (M/s) for each condition and group.

Table 1. Means and Standard Deviation for running speed for each condition and group.

Condition	M (metres/per sec)	SD (metres/per sec)
Pre-study (*n* = 39)	4.42	0.47
Baseline (*n* = 8)	4.40	0.56
Intervention (*n* = 9)	4.57	0.40
Active-Control (*n* = 9)	4.75	0.26
Post-Study (*n* = 23)	4.29	0.43

Post race reflection results, Results indicated that where interventions were positively regarded, they tended to co-occur with a good performance. For example,

"I found it helped massively with getting my focus back in sections where I was drifting off the pace/effort. I got a parkrun PB as well!"

"I ran my 2nd quickest ever parkrun on this course, which I have run over 160 times. It was the intervention that made the difference."

"It was especially helpful in the second mile (of three) of the parkrun. I usually struggle to maintain pace halfway through."

Where interventions were deemed ineffective, this reflected performance. For example:

"In using the if-then plan of 'relax & smile' I found it hard going, I think it made me subconsciously ease off the pace as my mind went off my rhythm and cadence."

Participants also reported that the brief interventions were not offering especially novel information, thereby recognizing that they used such skills already. From that they began to re-write the interventions into their own language. For example:

"I acknowledge there is an element of unconscious self-destruction on my part and that happened today."

"I am intending to reduce the self-talk to simple one or two-word phrases. e.g, For mile three I used 'leave it all out there' but found that too long and the wording was 'loose in my head' so less effective, so I am changing it to 'empty the tank; next time"

"Self-talk is a tool I use a lot so for me it wasn't anything new or surprising to learn."

"It helped me refocus in the sections where my concentration drifted. I couldn't say whether this was due to the specific skill or just due to knowing I had something to do."

"I believe the skill was quite useful. I was able to concentrate on my run more, rather than wanting to stop halfway through."

Across the three participants in the control group, all three reported strategies that could be considered interventions. For example,

"I try to focus and imagine myself running well."

"I focused a lot on thinking about the fact I was at peak training (for a marathon) and that this training block had gone well."

"I visualized the feeling of euphoria for how I would feel viewing my times getting quicker each week across your study,"

"I was focused on beating my time from the previous two weeks."

"In my plan I visualized running really strong," and

"focused on trying to keep a rhythm so I kept reminding myself of that in my head... Keeping and holding the rhythm was a useful strategy as I ran my fastest TT."

Results offered insight into how participants engaged with online training and an approach where information was delivered to them, that is a one-way approach to learning. A participant indicated that they wished to be presented with specific examples for their race rather than generic ones.

Discussion

This study investigated the effects of online brief interventions on 5km running time against participants' own data acting as a control and comparing data against a group of 3 participants that received no active training and labelled an active-control group. Recent research has shown that sport psychology interventions associate with significant improvements in performance, but these are often moderate in size although methodological factors if not adequately can dilute the effects (Meijen et al., 2023; Lochbaum et al., 2022). The present study sought to address these limitations, and use the recent expert review from Meijen to explore the effects and participants perceptions of using brief interventions. The small sample size indicates that this is a case study and so findings are not generalizable (Meijen et al., 2023).

The study used participants for whom performance improvements were a goal, and who signed up to receive a sport psychology intervention designed to achieve it. Participants were well trained, and their performance had plateaued. Such participants are not only useful for a sport psychology intervention as any improvements are less likely to be attributed towards training focused on physiological or skilled improvement, but also, because their performance from the previous 2 months provided reliable comparative data. When these factors are considered, results showed that the intervention group finished 164.11m of an active-control group and finished

347.37m ahead of their pre-study data. ANOVA results indicated that they ran significantly faster (p = .019). These findings suggest involvement in the research was beneficial to participants.

In terms of the potential reasons why performance improved more in the active-control than the intervention group we suggest that this might be attributed to the learning process and the influence of cognitive load on performance (Schlichta et al., 2022). In the active-control group, participants were encouraged to use strategies that they had used previously. Importantly, as with (Lane. Totterdell et al., 2016), participants were not given instructions as to how to improve performance, and therefore, there were no active agents that could be used to explain why performance improved. It should be noted that runners typically do use psychological skills as part of preparation (Stanley et al., 2012), and therefore encouragement should lead to using a skill more often.

In terms of how a sport psychologist might wish to add to the process, post-race reflections showed that participants in both groups used self-selected psychological strategies to manage the sensations of fatigue. Such a finding is consistent with the notion that runners use self-regulation skills that resemble psychological strategies (Meijen et al., 2023; Lane, Devonport et al., 2016; Stanley et al., 2012). Active self-regulation occurs when cognitive strategies, such as self-talk, are engaged to influence thoughts, feelings and actions (McCormick et al., 2020). All participants were aware that they were taking part in a study involving psychological strategies in relation to running performance. As such they were primed to focus on the mental aspect of their performance and may have used pre-existing cognitive strategies in a more focused or consistent fashion. In keeping with literature around metacognition and self-regulation (Brick et al., 2015), all participants received a prompt to engage existing self-regulation strategies. The study acted as a prompt to engage cognitive abilities to assist performance, and by doing so, created a positive belief that following the strategy would lead to faster performance (Beedie et al., 2018, 2020). A lesson for a sport psychologist would be to encourage participants to monitor and learn their inner dialogue that comes when feeling fatigued and explore the use of interventions when doing so. A sport psychologist could encourage where this can be learned, possibly in training or via imaginal experiences.

In a recent study of metacognitive processes in self-regulation, runners “appeared to have established, through experience, a means of prioritizing sensorimotor inputs to optimize running performance” (Brick et al., 2015). Importantly in the context of the present study, Brick et al suggested that: “Consequently, the athlete may make explicit metacognitive judgements or estimates regarding the (in)effectiveness of the cognitive strategy employed (e.g., estimate of solution correctness). Depending on the outcome of this metacognitive judgement, alongside continued monitoring of task performance, the athlete may choose to maintain their current attentional focus, or to adopt an alternative cognitive strategy” (Brick et al., 2015). Sport psychologists could encourage athletes to engage with meta-cognitive experiences via including reflections in a training diary, and then monitoring these reflections over time.

In terms of evidence on the perceived effectiveness of brief interventions as reported qualitatively, it appears positive reinforcement via performance accomplishments strengthens a belief that the intervention was useful and poor performance weakens the belief. In terms of the effectiveness of an if-then plan for performance enhancement, we suggest that this will depend on whether the ‘then’ part being used represents a good strategy, and with 5km running, the barrier might not present itself and so not cue the preferred solution. While encouraging participants to set their own if-then plans is recommended, it is possible that the problem does not present itself. If-then plans have been shown to be effective in contexts where the barrier repeats itself frequently and the person needs help to act on their good intention (Meijen et al., 2023) for a review. Clearly, a role for sport psychologist working with runners is to explore the barriers and via discussion, develop useful if-then plans. From this, identifying where runners can use, that is to set up a practice where the barrier presents itself to see if the solution came to mind, and if it did, how useful was it.

The present study has several limitations which will be raised in relation to how future research and practice might address them. The first is that the mechanisms to explain performance improvements would benefit from assessing physiological measures (Meijen et al., 2023). We suggest initial laboratory testing to obtain an accurate assessment of physiological capacity, and against which changes in performance could be compared. In the present study, we attempted to gather heart rate data, but wrist-based heart rates were not reliable (Hough et al., 2017).

A second limitation was the brief interventions were generic for endurance and not specific to 5km running, a limitation noted by participants in their feedback. In terms of the utility of brief interventions, results of the present study offer an encouraging start, but show that work is needed to ensure the content of the intervention is useful. However, we suggest that participant feedback provides useful practical information. In terms of usability, participants would have preferred specific examples relevant to 5km performance. A third limitation is the small sample size. Although 91 runs were used, which is sufficient, we suggest that future research uses a larger sample size. We suggest that participants should be recruited across more discrete PB times (e.g., for males, one participant in each condition with a 15-minute 5km PB; then minute increment PBs upwards) with both physiological data and existing psychological experience and ability to allow deeper insight to the application of skills by individuals.

CONCLUSION

The present study indicates that encouragement to use psychological skills whether taught in a brief intervention or a self-regulatory strategy that people already adopt lead to improved performance. Results show encouraging people to mentally prepare for performance associated with using cognitive strategies that helped performance. A challenge for future research is to effectively tease out why an intervention was effective and why it would remain so on larger sample sizes.

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AUTHOR CONTRIBUTIONS STATEMENT

DR recruited participants, ran the interventions, the design, data management and the write up. AL contributed to the design, data analysis, and write up. SH contributed to the design, data analysis and write-up. RC contributed to the write up.

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